ABSTRACT AND BIOGRAPHY

System Engineering Leading Indicators

The presentation discusses a four year initiative to transform classical systems engineering (SE) measures into *leading indicators*, including the resulting guidance information, application, and future research directions. Systems engineering leading indicators are measures for evaluating the effectiveness of the systems engineering activities on a program in a manner that provides information about impacts that are likely to affect the system or program performance objectives. A leading indicator may be an individual measure, or collection of measures, that is predictive of future system performance before the performance is realized. Contrary to simple status oriented measures typically used on most projects, leading indicators are intended to provide insight into the probable future state, allowing projects to improve the management and performance of complex programs before problems arise. This presentation discusses the motivations and collaborative development of the SE leading indicators. It defines the leading indicator construct, introduces the initial set of 13 indicators, and discusses guidance for implementation, analysis, and interpretation of these indicators. The initial set of indicators, developed through a collaboration of industry, government, and academia, has recently undergone validation through pilot studies and surveys. This work serves as a foundation for industry implementation and for further research to improve and expand the set of indicators, including development of a better understanding of how to best implement and use the leading indicators in a given program context. Current and planned future research directions will be discussed including the development of several new indicators, extension to systems of systems, and enhancement for human systems integration considerations.

Dr. Donna H. Rhodes
Senior Lecturer and Principal Research Scientist
Massachusetts Institute of Technology

Dr. Donna H. Rhodes is a Senior Lecturer and Principal Research Scientist in Massachusetts Institute of Technology's Engineering Systems Division. She is Director of the MIT Systems Engineering Advancement Research Initiative (SEAri) and also affiliated with the Lean Advancement Initiative (LAI). She received her Ph.D. in Systems Science from the T.J. Watson School of Engineering at SUNY Binghamton. Prior to joining MIT, Dr. Rhodes had 20 years of experience in the aerospace and defense, systems integration, and commercial product industries, including senior management positions at IBM, Lockheed Martin, and Lucent. Dr. Rhodes has been very involved in the evolution of the systems engineering field, as well as the development of several university graduate programs. She has served on a number of corporate and government boards focused on the advancement of the systems practice and education, as well as on study panels for issues of national and international importance. Dr. Rhodes is a Past President and Fellow of INCOSE, and is a recipient of the INCOSE Founders Award. Dr. Rhodes has research interests and advises ongoing research projects in the following areas: advanced systems engineering methods; systems

engineering leading indicators; defense and commercial systems practices and case studies; value based decision analysis; systems principles and practices applied to enterprises; managing for complexity and uncertainty; systems-of-systems engineering; and strategies for high performing enterprises in the engineering systems context.